Rain, provide coverage through a distance of 5 nautical miles with rain falling at a rate of 50 millimeters per hour, and with rain falling at the rate of 25 millimeters per hour for the additional design performance range of the system.

Ice loading, encased in ½″ radial thickness of clear ice.

(d) The ISMLS must perform in accordance with the following standards and practices for Facility Performance Category I operation:

(1) The ISMLS must be constructed and adjusted so that, at a specified distance from the threshhold, similar instrumental indications in the aircraft represent similar displacements from the course line or ISMLS glide path, as appropriate, regardless of the particular ground installation in use.

(2) The localizer and glide path components listed in paragraphs (a)(1) and (a)(2) of this section which form part of an ISMLS, must comply at least with the standard performance requirements specified herein. The marker beacon components listed in paragraph (a)(3) of this section which form part of an ISMLS, must comply at least with the standard performance requirements specified in subpart H of this part.

(3) The ISMLS must be so designed and maintained that the probability of operation is within the performance requirements specified in §171.273(k).

(e) The signal format and pairing of the runway localizer and glide path transmitter frequencies of an ISMLS must be in accordance with the frequency plan approved by the FAA, and must meet the following signal format requirements:

(1) The localizer and glide slope stations must transmit angular guidance information on a C-band microwave carrier on narrow, scanned antenna beams that are encoded to produce a modulation in space which, after averaging over several beam scans, is equivalent to the modulation used for conventional ILS as specified in subpart C of this part, except that the frequency tolerance may not exceed ±0.0001 percent.

(2) Guidance modulation must be impressed on the microwave carrier of the radiated signal in the form of a summation of 90 Hz and 150 Hz sinusoidal modulation corresponding to the pointing direction of the particular beam which radiates the signal.

(3) Each of the effective beam positions must be illuminated in a particular sequence for a short time interval. The modulation impressed on each beam must be a sample of the combined 90 Hz and 150 Hz waveform appropriate for that particular beam direction and time slot, and must be accomplished by appropriately varying the length of time the carrier is radiated during each beam illumination interval.

(4) For those cases where the scanning beam fills the coverage space in steps, the incremental step must not exceed 0.6 times the beam width where the beam is in the proportional guidance sector. In the clearance region, the step may not exceed 0.8 times the beam width.

(5) At least one pulse duration modulation (pdm) sample pulse per beam width of scan must be provided.

(6) The minimum pulse duration must be 40 microseconds.

(7) The minimum beam scan cycle must be 600 Hz.

(8) The minimum duty ratio detectable by a receiver located anywhere in the coverage areas defined by this specification may not be less than 0.1. Detected duty ratio means the ratio of the average energy per scan detected at a point in space to the average energy per scan transmitted in all directions through the transmitting antenna.

(9) The localizer must produce a C-band unmodulated reference frequency signal of sufficient strength to allow satisfactory operation of an aircraft receiver within the specified localizer and glide path coverage sectors. Pairing of this reference frequency with the localizer and glide slope frequencies must be in accordance with a frequency plan approved by the FAA.

§171.261 Localizer performance requirements.

This section prescribes the performance requirements for localizer equipment components of the ISMLS.

(a) The localizer antenna system must:

(1) Be located on the extension of the centerline of the runway at the stop end;

(2) Be adjusted so that the course line be on a vertical plane containing the centerline of the runway served;

(3) Have the minimum height necessary to comply with the coverage requirements prescribed in paragraph (j) of this section;

(4) Be located at a distance from the stop end of the runway that is consistent with safe obstruction clearance practices;

(5) Not obscure any light of the approach landing system; and

(6) Be installed on frangible mounts or beyond the 1000′ light bar.

(b) On runways where limited terrain prevents the localizer antennae from being positioned on the runway centerline extended, and the cost of the land fill or a tall tower antenna support is prohibitive, the localizer antenna array may be offset, including a collocated ground station, so that the course intercepts the centerline at a point determined by the amount of the angular offset and the glide path angle. If other than a runway centerline localizer is used, the criteria in subpart C of part 97 of this chapter is applicable.

(c) At locations where two separate ISMLS facilities serve opposite ends of of a single runway, an interlock must ensure that only the facility serving the approach direction being used will radiate.

(d) The radiation from the localizer antenna system must produce a composite field pattern which is pulse duration modulated, the time average equivalent to amplitude modulation by a 90 Hz and 150 Hz tone. The localizer station must transmit angular guidance information over a C-band microwave carrier on narrow, scanned antenna beams that are encoded to produce a modulation in space which, after averaging over several beam scans, is equivalent to the modulation used for conventional ILS as specified in subpart C of this part. The radiation field pattern must produce a course sector with one tone predominating on one side of the course and with the other tone predominating on the opposite side. When an observer faces the localizer from the approach end of the runway, the depth of modulation of the radio frequency carrier due to the 150 Hz tone must predominate on his right hand and that due to the 90 Hz tone must predominate on his left hand.

(e) All horizontal angles employed in specifying the localizer field patterns must originate from the center of the localizer antenna system which provides the signals used in the front course sector.

(f) The ISMLS course sector angle must be adjustable between 3 degrees and 9 degrees. The applicable course sector angle will be established and approved on an individual basis.

(g) The ISMLS localizer must operate in the band 5000 MHz to 5030 MHz. The frequency tolerance may not exceed ±0.0001 percent.

(h) The emission from the localizer must be vertically polarized. The horizontally polarized component of the radiation of the course line may not exceed that which corresponds to a DDM error of 0.016 when an aircraft is positioned on the course line and is in a roll attitude of 20 degrees from the horizontal.

(i) The localizer must provide signals sufficient to allow satisfactory operation of a typical aircraft installation within the localizer and glide path coverage sectors. The localizer coverage sector must extend from the center of the localizer antenna system to distances of 18 nautical miles minimum within ±10 degrees from the front course line, and 10 nautical miles minimum between ±10 degrees and ±35 degrees from the front course line. The ISMLS localizer signals must be receivable at the distances specified up from a surface extending outward from the localizer antenna and within a sector in the elevation plane from 0.300 to 1.750 of the established glide path angle (θ).

(j) Except as provided in paragraph (k) of this section, in all parts of the coverage volume specified in paragraph (i) of this section, the peak field strength may not be less than -87 dBW/m^2, and must permit satisfactory operational usage of ISMLS localizer facilities.

(k) The minimum peak field strength on the ISMLS glide path and within the localizer course sector from a distance of 10 nautical miles to a height of

100 feet (30 meters) above the horizontal plane containing the threshold, may not be less than +87 dBW/m^2.

(l) Above 16 degrees, the ISMLS localizer signals must be reduced to as low a value as practicable.

(m) Bends in the course line may not have amplitudes which exceed the following:

Zone	Amplitude (DDM) (95 pct. probability)
Outer limit of coverage to:	
ISMLS point "A"	0.031.
ISMLS point "A" to ISMLS point "B".	0.031 at ISMLS point "A" decreasing at linear rate to 0.015 at ISMLS point "B".
ISMLS point "B" to ISMLS point "C".	0.015.

(n) The amplitudes referred to in paragraph (m) of this section are the DDMs due to bends as realized on the mean course line, when correctly adjusted.

(o) The radio frequency carrier must meet the following requirements:

(1) The nominal depth of modulation of the radio frequency carrier due to each of the 90 Hz and 150 Hz tones must be 20 percent along the course line.

(2) The depth of modulation of the radio frequency carrier due to each of the 90 Hz and 150 Hz tones must be between 18 and 22 percent.

(3) The frequency tolerance of the 90 Hz and 150 Hz modulated tones must be within ±25 percent.

(4) Total harmonic content of the 90 Hz tone may not exceed 10 percent.

(5) Total harmonic content of the 150 Hz tone may not exceed 10 percent. However, a 300 Hz tone may be transmitted for identification purposes.

(6) At every half cycle of the combined 90 Hz and 150 Hz wave form, the modulation tones must be phase-locked so that within the half course sector, the demodulated 90 Hz and 150 Hz wave forms pass through zero in the same direction within 20 degrees with phase relative to the 150 Hz component. However, the phase need not be measured within the half course sector.

(p) The mean course line must be adjusted and maintained within ±.015DDM from the runway centerline at the ISMLS reference datum.

(q) The nominal displacement sensitivity within the half course sector at the ISMLS reference datum, must be 0.00145 DDM/meter (0.00044DDM/foot). However, where the specified nominal displacement sensitivity cannot be met, the displacement sensitivity must be adjusted as near as possible to that value.

(r) The lateral displacement sensitivity must be adjusted and maintained within 17 percent of the nominal value. Nominal sector width at the ISMLS reference datum is 210 meters (700 feet).

(s) The increase of DDM must be substantially linear with respect to angular displacement from the front course line where DDM is zero, up to angle on either side of the front course line where the DDM is 0.180. From that angle to ±10 degrees, the DDM may not be less than 0.180. From ±10 degrees to ±35 degrees, the DDM may not be less than 0.155.

(t) The localizer must provide for the simultaneous transmission of an identification signal which meets the following:

(1) It must be specific to the runway and approach direction, on the same radio frequency carrier, as used for the localizer function.

(2) Transmission of the identification signal may not interfere in any way with the basic localizer function.

(3) The signal must be produced by pulse duration modulation of the radio frequency carrier resulting in a detected audio tone in the airborne VHF receiver of 1020 Hz ±50Hz.

(4) The depth of modulation must be between the limits of 10 and 12 percent.

(5) The emissions carrying the identification signal must be vertically polarized.

(6) The identification signal must employ the International Morse Code and consist of three letters. It must be preceded by the International Morse Code signal of the letter ''M'' followed by a short pause where it is necessary to distinguish the ISMLS facility from other navigational facilities in the immediate area. At airports where both an ISMLS and an ILS are in operation, each facility must have a different identification call sign.

(7) The signal must be transmitted at a speed corresponding to approximately seven words per minute, and must be repeated at approximately

equal intervals, not less than six times per minute, during which time the localizer is available for operational use. When the localizer is not available for transmission, the identification signal must be suppressed.

§ 171.263 Localizer automatic monitor system.

(a) The ISMLS localizer equipment must provide an automatic monitor system that transmits a warning to designated local and remote control points when any of the following occurs:

(1) A shift of the mean course line of the localizer from the runway centerline equivalent to more than 0.015 DDM at the ISMLS reference datum.

(2) For localizers in which the basic functions are provided by the use of a single-frequency system, a reduction of power output to less than 50 percent of normal or a loss of ground station identification transmissions.

(3) Changes of displacement sensitivity to a value differing by more than 17 percent from nominal value for the localizer.

(4) Failure of any part of the monitor itself. Such failure must automatically produce the same results as the malfunctioning of the element being monitored.

(b) Within 10 seconds of the occurrence of any of the conditions prescribed in paragraph (a) of this section, including periods of zero radiation, localizer signal radiation must cease or the navigation and identification components must be removed.

§ 171.265 Glide path performance requirements.

This section prescribes the performance requirements for glide path equipment components of the ISMLS. These requirements are based on the assumption that the aircraft is heading directly toward the facility.

(a) The glide slope antenna system must be located near the approach end of the runway, and the equipment must be adjusted so that the vertical path line will be in a sloping horizontal plane containing the centerline of the runway being served, and satisfy the coverage requirements prescribed in paragraph (g) of this section. For the purpose of obstacle clearance, location of the glide slope antenna system must be in accordance with the criteria specified in subpart C of part 97 of this chapter.

(b) The radiation from the glide path antenna system must produce a composite field pattern which is pulse duration modulated by a 90 Hz and a 150 Hz tone, which is the time average equivalent to amplitude modulation. The pattern must be arranged to provide a straight line descent path in the vertical plane containing the centerline of the runway, with the 150 Hz tone predominating below the path and the 90 Hz tone predominating above the path to at least an angle equal to 1.75θ. As used in this section theta (θ), denotes the nominal glide path angle. The glide path angle must be adjusted and maintained within 0.075θ.

(c) The glide path equipment must be capable of producing a radiated glide path from 3 to 9 degrees with respect to the horizontal. However, ISMLS glide path angles in excess of 3 degrees may be used to satisfy instrument approach procedures or to overcome an obstruction clearance problem, only in accordance with the criteria specified in subpart C of part 97 of this chapter.

(d) The downward extended straight portion of the ISMLS glide path must pass through the ISMLS reference datum at a height ensuring safe guidance over obstructions and safe and efficient use of the runway served. The height of the ISMLS reference datum must be in accordance with subpart C of part 97 of this chapter.

(e) The glide path equipment must operate in the band 5220 MHz to 5250 MHz. The frequency tolerance may not exceed ±0.0001 percent.

(f) The emission from the glide path equipment must be vertically polarized.

(g) The glide path equipment must provide signals sufficient to allow satisfactory operation of a typical aircraft installation insectors of 8 degrees on each side of the centerline of the ISMLS glide path, to a distance of at least 10 nautical miles up to 1.75θ and down to 0.45θ above the horizontal or to such lower angle at which 0.22 DDM is realized.